START

0015314

UNCLASSIFIED

UNC NUCLEAR INDUSTRIES

A UNC RESOURCES Company

P.O. Box 490
Richland, Washington 99352

PREPARED FOR THE
UNITED STATES DEPARTMENT OF ENERGY
UNDER CONTRACT NUMBER DE-AC06-76RL01857

Document No.
UNI-3049

Date
August 9, 1985

Copy No.
13

(Reserved For Document Control Center Use Only)

RECORD CENTER FILE

REFERENCE COPY

RECEIVED
AUG 26 1985
UNC NUCLEAR INDUSTRIES
DOCUMENT CONTROL CENTER

Title

115-F GAS RECIRCULATION BUILDING INDIVIDUAL FACILITY DECOMMISSIONING REPORT

Author

J. C. Chattin, E. W. Powers

DISTRIBUTION

NAME	BLDG/RM/MS	NAME	BLDG/RM/MS
DOE-RL			
1. JH Slaughter	FED 660D		
UNC			
2. JA Adams	1115 Jadwin,J1		
3. JF Beckstrom	1720K/8/K3		
4. DF Brendel	1114N/4/S4		
5. N Castorina	105B/K8		
6. RN Coy	FED/371/F22		
7. JT Fulton	1720K/15/K1		
8. BW Mathis	1720K/9/K9		
9. MA Mihalic	1720K/9/K3		
10. RF Potter	FED/377/F21		
11. RA Winship	FED/377/F21		
12. UNI File			
13. UNI Record			
14. Extra			
15. Extra			

AUG 1991
RECEIVED
EDMC

ROUTE TO	PAYROLL NO.	LOCATION	FILES ROUTE DATE	SIGNATURE AND DATE
UNI RECORD				

UNCLASSIFIED

BM-5100-184 (4-85)

UNC NUCLEAR INDUSTRIES, INC.

RICHLAND, WA. 99352

NOTICE

THIS REPORT WAS PREPARED AS AN ACCOUNT OF WORK SPONSORED BY THE UNITED STATES GOVERNMENT. NEITHER THE UNITED STATES NOR THE UNITED STATES DEPARTMENT OF ENERGY, NOR ANY OF THEIR EMPLOYEES, NOR ANY OF THEIR CONTRACTORS, SUBCONTRACTORS, OR THEIR EMPLOYEES, MAKES ANY WARRANTY, EXPRESS OR IMPLIED, OR ASSUMES ANY LEGAL LIABILITY OR RESPONSIBILITY FOR THE ACCURACY, COMPLETENESS OR USEFULNESS OF ANY INFORMATION, APPARATUS, PRODUCT OR PROCESS DISCLOSED, OR REPRESENTS THAT ITS USE WOULD NOT INFRINGE PRIVATELY OWNED RIGHTS.

DISCLAIMER

THIS REPORT WAS PREPARED FOR USE WITHIN UNC NUCLEAR INDUSTRIES, INC., IN THE COURSE OF WORK UNDER SUPPLEMENTAL AGREEMENT TO THE UNITED STATES DEPARTMENT OF ENERGY CONTRACT DE-AC06-76RL01857. ANY VIEWS OR OPINIONS EXPRESSED IN THE REPORT ARE THOSE OF THE AUTHOR ONLY. THIS REPORT IS SUBJECT TO REVISION UPON COLLECTION OF ADDITIONAL DATA.

115-F GAS RECIRCULATION BUILDING
INDIVIDUAL FACILITY DECOMMISSIONING REPORT

PREPARED BY ______________________ DATE 6/3/85
J. C. Chattin, Senior Communications Coordinator
Information Services

REVIEWED BY E. W. Powers DATE 6/6/85
E. W. Powers, Principal Engineer
Decommissioning Engineering

REVIEWED BY M. A. Mihalic DATE 6/14/85
M. A. Mihalic, Manager
Decommissioning Engineering

APPROVED BY J. T. Fulton DATE 8/8/85
J. T. Fulton, Manager
Decommissioning Services

THIS PAGE INTENTIONALLY
LEFT BLANK

TABLE OF CONTENTS

TABLE OF CONTENTS - continued

LIST OF TABLES

LIST OF FIGURES

SUMMARY

The 115-F Gas Recirculation Facility and a portion of the pipe tunnel to the 105-F Reactor Building were decommissioned by UNC Nuclear Industries, Decommissioning Services in fiscal year 1984. Upon completion of this project the site was restored to a near original condition. All above-grade portions of the facility were demolished and covered with a minimum of one meter of clean earth. The radiological waste generated during this project (4,992 ft^3) (141 m^3) consisted primarily of equipment, and piping with some asbestos, which was removed for disposal in the Hanford 200 Area. Clean building rubble and debris were removed for disposal in a clean landfill site; contaminated building rubble and debris were buried on site. Leaving this residual radioactive contamination in-situ will result in an estimated radiological dose to a hypothetical maximally exposed, full-time site resident of less than 2 millirems per year.

The contamination levels in the 115-F Gas Recirculation Building and tunnel were low and posed no significant hazards to decommissioning personnel. The low contamination levels also permitted the use of the Allowable Residual Contamination Levels (ARCL) methodology, which became effective during this project time period.

Decommissioning work proceeded in three basic steps: planning and site preparation (including radiological characterization); decontamination and equipment removal; and facility demolition and final site grading and leveling.

Site preparation began September 22, 1983; removal of equipment and tunnel piping was completed in March 1984. Following 2 months of relative inactivity while ARCL calculation approvals were being obtained, demolition work was restarted in August 1984. The overall decommissioning project was completed as scheduled, within budget, in September 1984 at a total cost of $874,000.

THIS PAGE INTENTIONALLY LEFT BLANK

1.0 INTRODUCTION

This report documents the decommissioning of the 115-F Gas Recirculation Building and its associated tunnel to the 105-F Reactor Building.

The final decommissioning of the 115-F Building was accomplished in accordance with UNC's radiation control procedures (Reference 1) and under the ARCL methodology (Reference 2), which became effective during the project time period.

The above-grade portions of the building were demolished using standard demolition equipment and procedures. The below-grade perimeter walls, which extend about 4 meters below the original grade, were left intact, and serve as containment for the contaminated building rubble. The entire area was covered with a minimum of 1 meter of clean backfill, then graded and leveled.

Decontamination work, which consisted of site preparations, contaminated piping and equipment removal, and disposal, was completed by May 1984. This phase also included the radiological characterizations (gridding and recording) required by the ARCL methodology. Demolition began in August 1984, after the ARCL calculations (Reference 3) were approved. Final site grading was completed in October 1984.

1.1 DECOMMISSIONING OBJECTIVE

The objectives of decommissioning the 115-F Building were to:

- Remove all radioactively contaminated equipment and piping from the building and tunnel
- Decontaminate the facility to release criteria identified in Reference 1
- Demolish the structure to about 1 meter below grade
- Backfill and grade the site to blend with the surrounding environment

1.2 WORK SCOPE

The scope of the 115-F Gas Recirculation Building decommissioning work included:

- o Engineering and planning
- o Radiation surveys and sampling
- o Contaminated equipment and piping removal
- o Demolition and site grading
- o Report closeout

1.3 RECORDS

All decommissioning data for the 115-F are maintained by the UNC Decommissioning Engineering Subsection. Records include costs, radiological data (pre- and post-decommissioning), all documents in the Project Readiness Review Report (see Section 3.1), photographs of all phases of the decommissioning project, and all engineering calculations and related data.

This decommissioned facility lies within the permanent radiological zone burial markers at 100-F Area, documented on Project H-538 drawings H-1-15244. The facilities construction drawing civil survey coordinates are documented on drawing W-73174. Equations to convert coordinates from Hanford grid system to the Washington state grid system (Lambert) for 100-F Area are also documented on drawing H-1-15244.

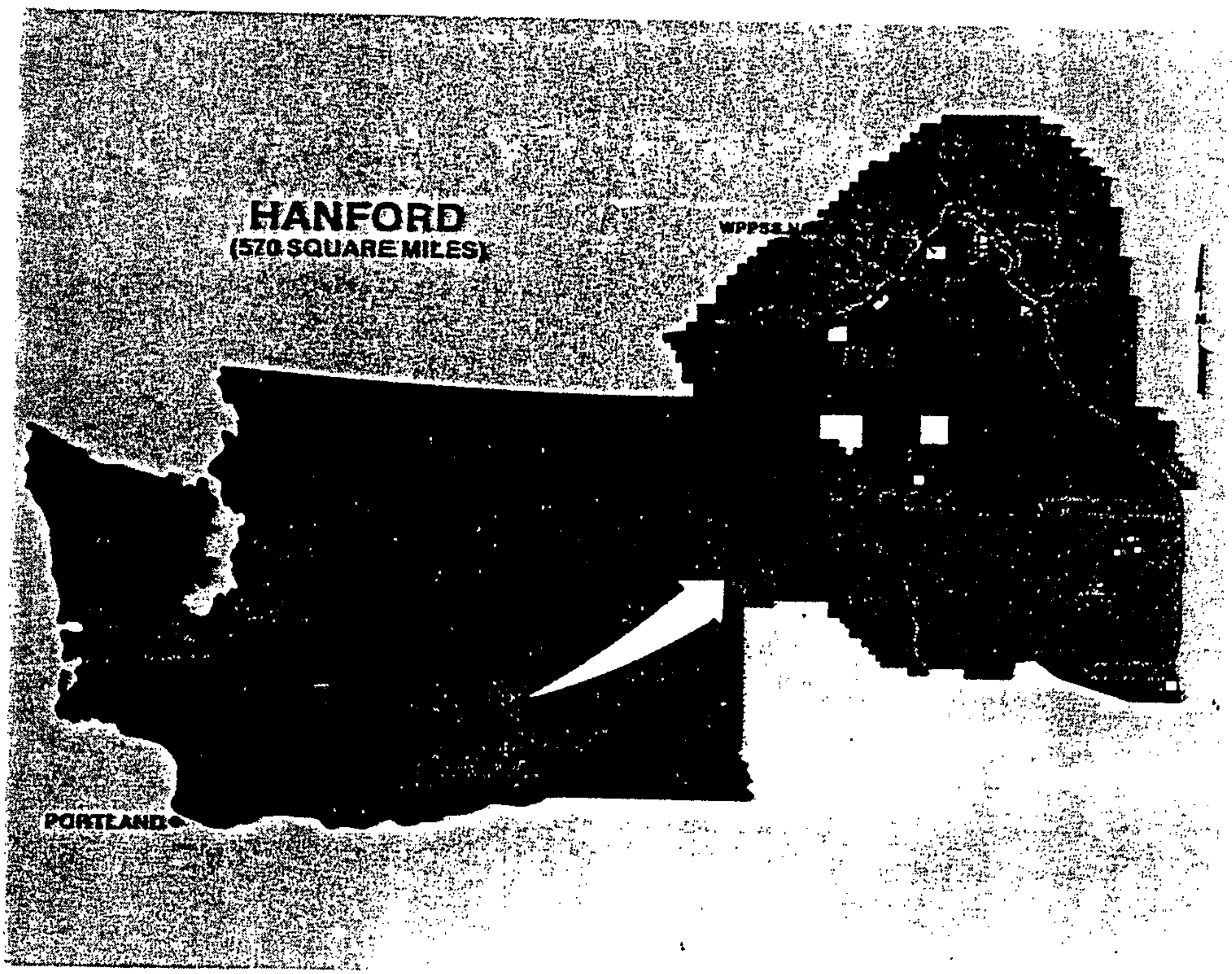


Figure 2-1. Hanford Site.

2.0 DESCRIPTION OF FACILITY

2.1 HISTORY

The 115-F Gas Recirculation Building operated from 1943 to 1965, concurrent with the startup and shutdown of the 105-F Reactor.

The 105-F Reactor facility included a recirculating gas system which provided an inert, nonradioactive gas environment within the reactor. The purpose of the inert atmosphere was to: a) remove moisture and foreign gases from the reactor; b) transfer heat from the graphite to the process tubes; c) control reactivity; d) allow detection of water leaks within the reactor; and e) minimize oxidation of the graphite moderator. A mixture of helium and carbon dioxide was used for most of the system's operation. A helium-nitrogen mixture was used for the last several years.

The gas system continuously recirculated a large volume of gas at very low pressure. The recirculation cycle included cooling, drying, and filtering of the gas prior to reentry into the reactor. The 115-F Building housed the equipment for pumping the gas through the system, processing it prior to recirculation through the reactor, and monitoring and regulating moisture content.

2.2 LOCATION

The 100-F Area is located within the Hanford Site (Figure 2-1) on the south bank of the Columbia River, approximately 30 river miles upstream and 25 road miles from the City of Richland. The Hanford Site is located in southeastern Washington State.

2.3 PHYSICAL DESCRIPTION

The 115-F Building was a single-story reinforced concrete structure located approximately 200 ft (61 m) due west of the 105-F Building (Figure 2-2). The building was approximately 168 ft (51 m) long by 98 ft (30 m) wide and 20 ft (6 m) high. An 18-ft (6 m) wide operating gallery extended 132 ft (40 m) down the center of tne building, and was flanked on either side by cells which contained the gas processing equipment.

There was no entry to the equipment cells from the operating gallery; cell entry was from the outside of the building via a labyrinth. The equipment cell walls and floors were constructed of reinforced concrete and were 3 feet (1 m) thick. At right angles to the operating gallery and extending across the full width of the building's west end, was the service section, which contained the ventilation fan, air compressor, office, locker room, etc. Figure 2-3 shows exterior views of the 115-F Building. Figure 2-4 shows the process cell arrangement and building layout. Figure 2-5 illustrates the gas flow through the recirculating system.

A pipe tunnel 36 feet (11 m) wide by 8 feet (2.5 m) high ran beneath the full length of the building. The main gas lines to and from the 105-F Building entered the 115-F Building through this tunnel. Piping of various sizes connected the process rooms or cells with the main inlet and outlet gas headers in the tunnel.

Processing the recirculating gas consisted of first cooling the gas and condensing most of the moisture it had picked up from the reactor, then passing the gas through a drying tower which contained silica gel to absorb the small amount of remaining moisture, and then filtering the gas before feeding it back into the reactor inlet gas header. The gas process equipment and the blowers which moved the gas through the system were located in the process cells located along tne length of the 115-F Building operating gallery.

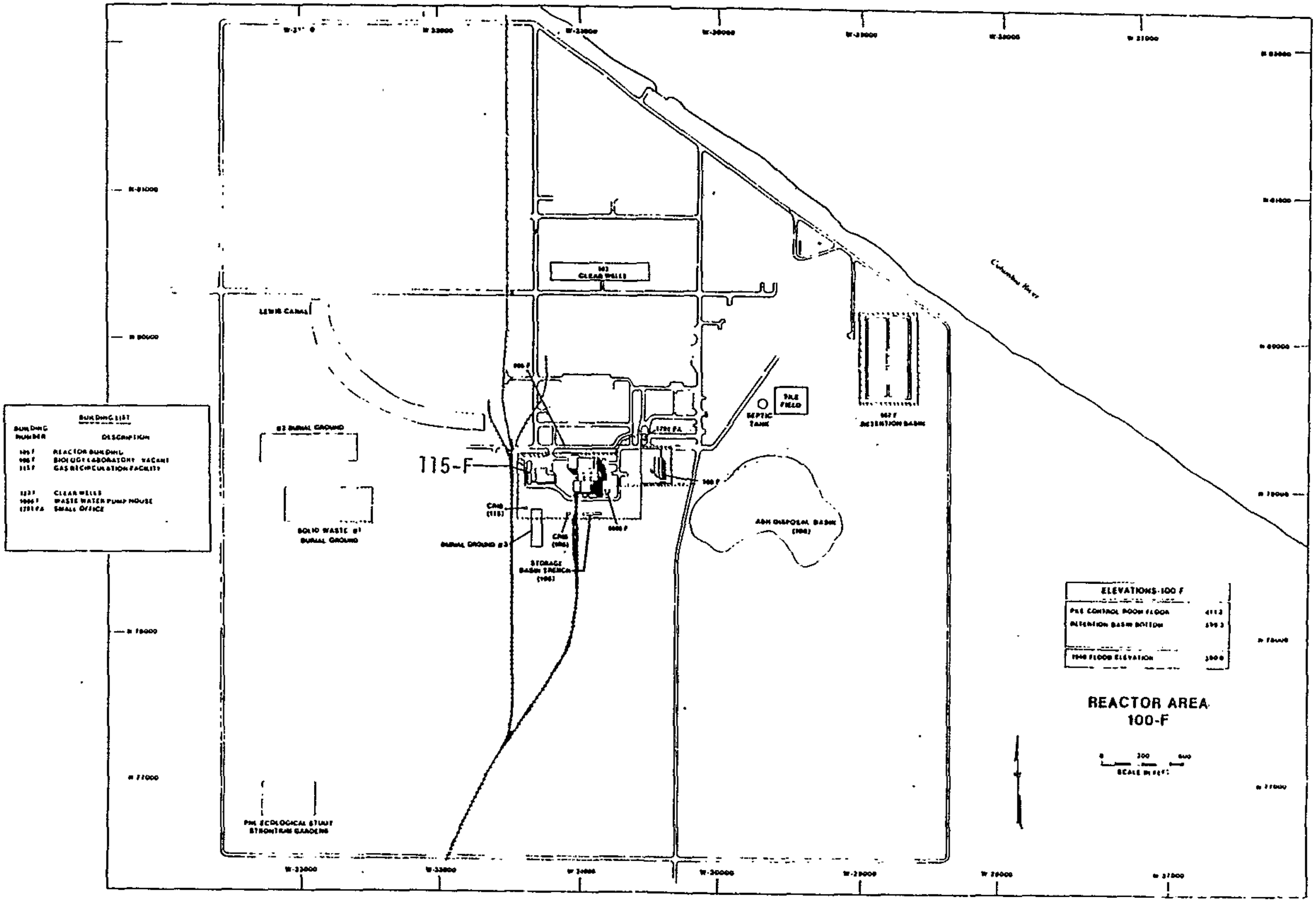


Figure 2-2. Hanford 100-F Area.

UNI-3049

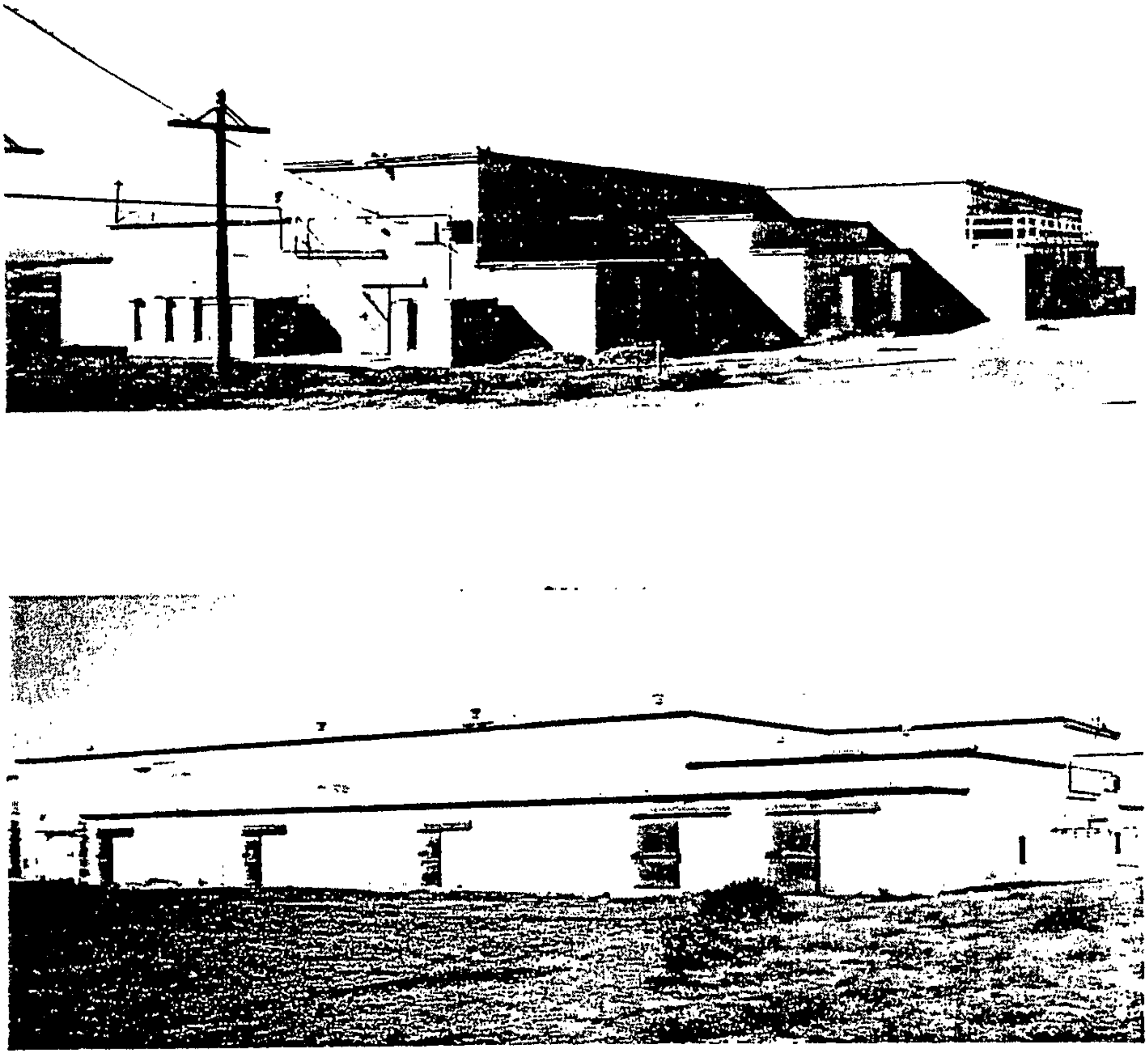


Figure 2-3. 115-F Gas Recirculation Building.

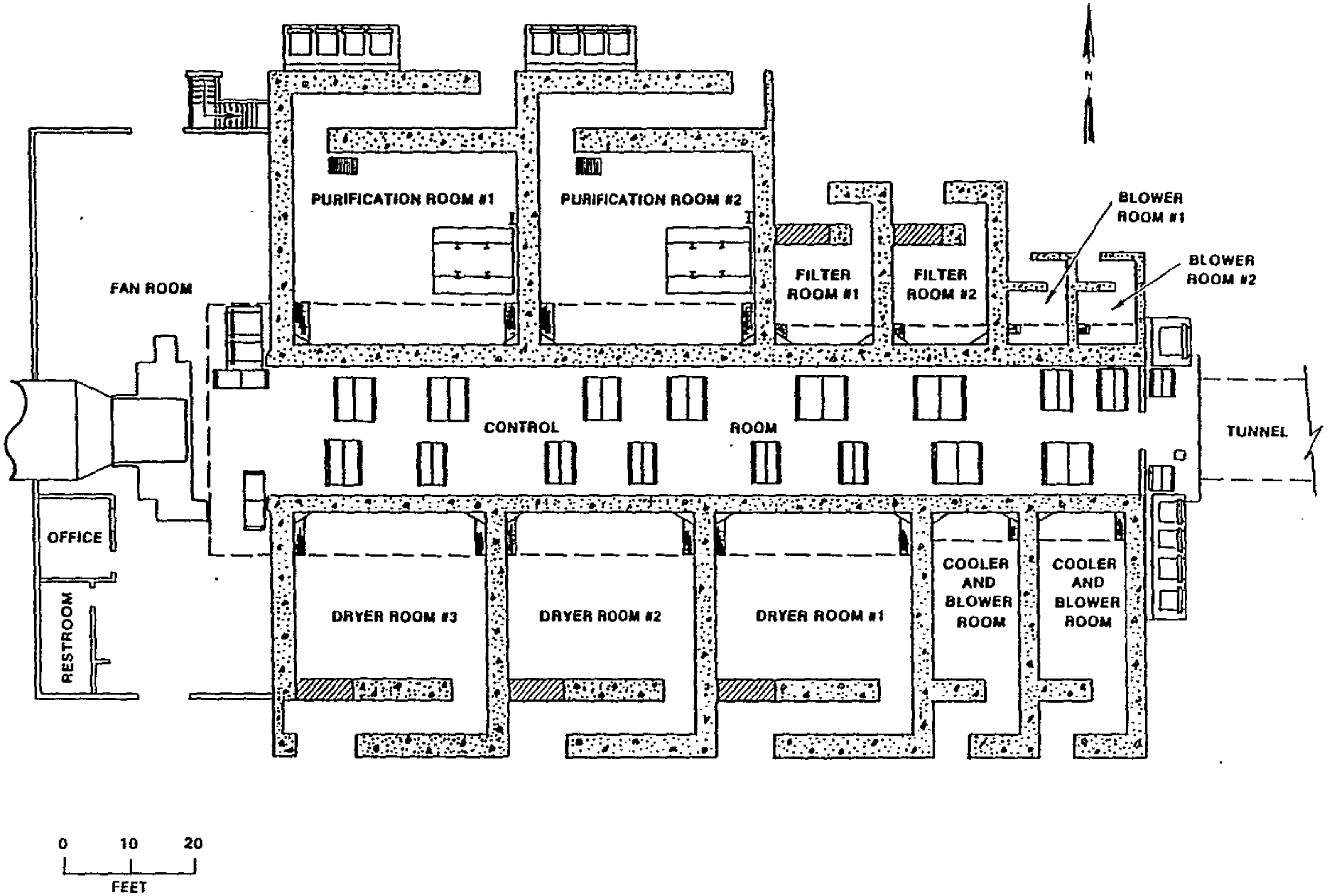


Figure 2-4. 115-F Building Process Cells.

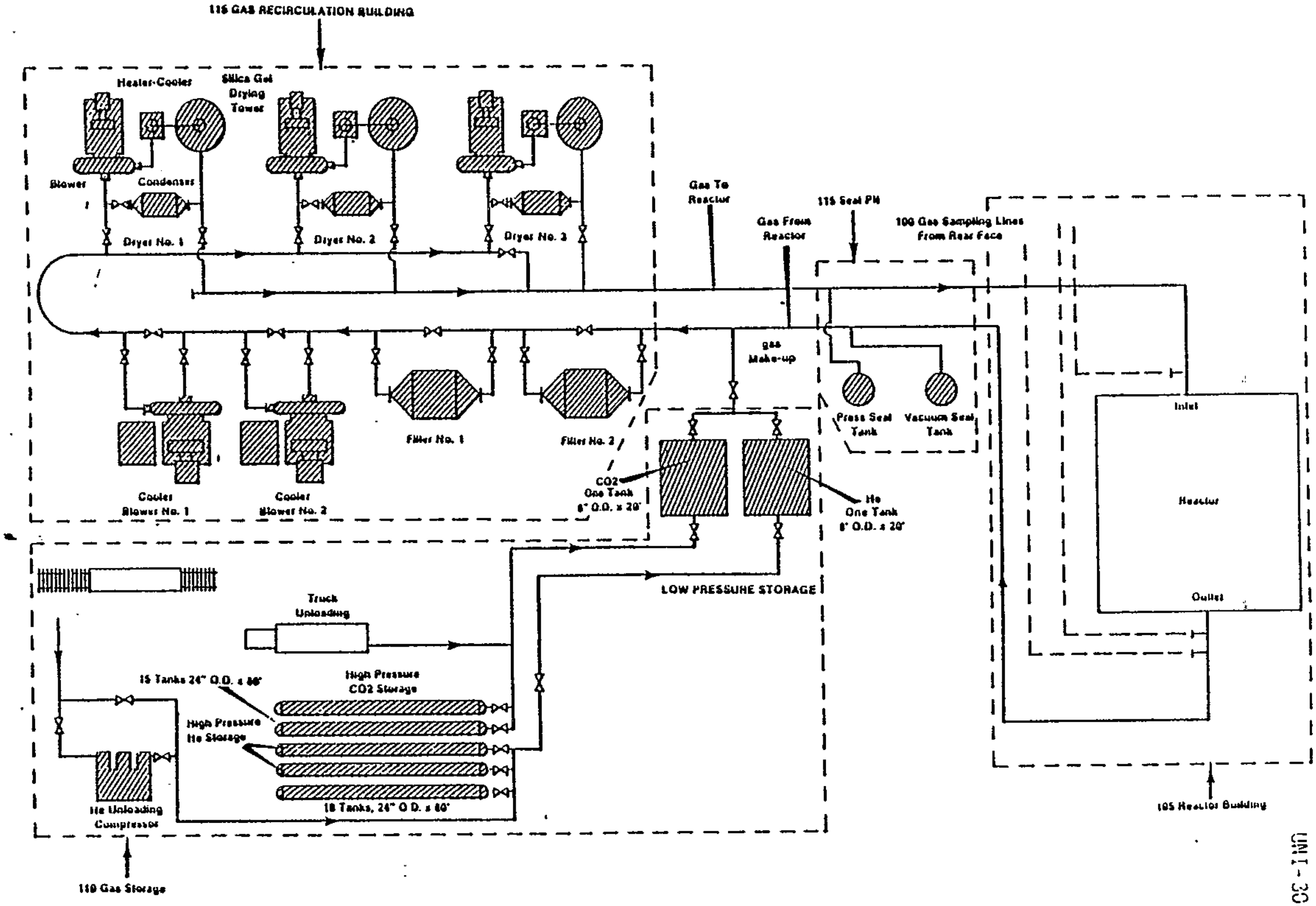


Figure 2-5. Gas Flow through the 115-F Building.

2.4 MAJOR EQUIPMENT

Table 2-1 lists the major equipment in the 115-F facility process cells.

TABLE 2-1
MAJOR EQUIPMENT IN THE 115-F PROCESS CELLS

Item	No.	Approximate Size
Silica Gel Towers	3	7 ft (2.1 m) dia x 7 ft (2.1 m) high
Filters	2	6 ft (1.9 m) x 6 ft (1.8 m) (filtered area)
Heater-Coolers	3	3 ft (.9 m) x 3 ft (.9 m) x 1.5 ft (.5 m)
Coolers	2	2 ft (.6 m) dia x 6 ft (1.8 m) long
Condensers	3	2 ft (.6 m) dia x 6 ft (1.8 m) long
Blowers	5	1800 cfm (51 m^3/min)

The building also contained process and service, piping, instrumentation, electrical wiring and control centers.

The major equipment items in the service section of the 115-F Building (west end) were the supply fan for the heating and ventilating system and two large air compressors, one electric-powered and one steam-powered.

2.5 RADIOLOGICAL CONDITION

Pre-decommissioning radiation and contamination levels in the 115-F Building were low and presented no problems to decommissioning personnel. The radiation readings shown in Table 2-2 were made in August 1976, slightly more than 11 years after the 115-F building was shut down. General background readings were less than 1 mR/hr. Surface smears taken for alpha contamination revealed less than 200 dpm/100 cm^2 on all surfaces tested.

TABLE 2-2
PRE-DECOMMISSIONING RADIATION SURVEY

DRYER ROOMS

DIRECT READINGS (cpm)	Room 1	Room 2	Room 3
Condensor	1,500	25,000	25,000
Condensate Drain	2,000	8,000	3,000
Blower	3,000	2,000	4,000
Inside Condensor (sample)	-	10,000	-
SMEARS (100 cm^2, β-γ)			
Floor & Walls	300	300	400

FILTER ROOMS

DIRECT READINGS (cpm)	Room 1	Room 2
Filter (maximum)	1,000	200
Floor & Walls	200	200
SMEARS (100 cm^2, β-γ)		
Floor & Walls	500	300
Filter Box	500	300

COOLER-BLOWER ROOMS

DIRECT READINGS (cpm)	Room 1	Room 2
Direct Scan	200	200
SMEARS (100 cm^2, β-γ)	200	200

TUNNEL

DIRECT READINGS (cpm)	
Background, Tunnel East End	600
Background, Tunnel West End	200
Piping, East End	15,000
Piping, West End	300
Floor Drain	200
SMEARS (100 cm^2, β-γ)	
Floor & Walls	300
Piping	300

2.6 ARCL CALCULATIONS

The ARCL methodology (References 2 and 3) was used to calculate the potential radiological dose to a hypothetical, maximally exposed site resident after decommissioning is complete. The estimated post-decommissioning dose to a full-time, hypothetical site resident is approximately 2 mrem/year. The data in Table 2-3, taken from Reference 3, show the specific activity and the ARCL value for each room in the 115-F facility. Only a small fraction of the surface area in the 115-F facility was contaminated. In each room, post-demolition radioactivity levels are substantially less than the applicable ARCL value. Radionuclide inventories in the 115-F facility and tunnel were determined from radiation surveys made shortly before the demolition began and from previously collected characterization data reported in Reference 4. The principal radionuclides in the 115-F Building were Sr-90, C-14, H-3, and Cs-137.

TABLE 2-3

COMPARISON OF RESIDUAL RADIOACTIVITY LEVELS AND ARCL VALUES

CALCULATION STEP	COOLER BLOWER #1	COOLER BLOWER #2	DRYER ROOM #1	DRYER ROOM #2	DRYER ROOM #3	TUNNEL AREA A
Specific Activity of Rubbled Concrete (pCi/g)	3.4	0.91	145	84	7	306
ARCL Limit (pCi/g)	59	12	424	1087	82	912

The 115-F Building and its associated tunnel to the 105-F Reactor Building were thoroughly surveyed as the first step in the decommissioning project. Each room was laid out in a diagram; the walls, floors and ceilings were divided into quadrants. Each quadrant was surveyed with portable alpha and beta-gamma instruments and a micro-R-meter. Technical smears and gross masslinn smears were also collected and recorded in each quadrant. Based on these radiological surveys, contamination on all concrete surfaces was identified, mapped and recorded.

Except for a few floor surfaces, no 115-F facility surface had contamination levels above the unrestricted release limits. Accordingly, concrete samples were collected only from the floor surfaces. These samples were analyzed with a multi-channel analyzer to determine isotopic inventories.

The cooler/blower rooms, dryer rooms, and the tunnel contained low-level contamination. The areas of contamination and the counts per minute detected in each contaminated area are identified and mapped in Reference 3. For the ARCL calculations, when fairly consistent activity levels were encountered for any given room or surface, the highest activity sample was taken as worst case, and the entire contaminated surface was assumed to contain this amount of activity. When sample analyses indicated a significant range of activities within a contaminated surface, the results were averaged to determine an overall activity level for the surface.

3.0 PROJECT MANAGEMENT

3.1 ORGANIZATION

Initially, the Decommissioning Operations group under the Office of Surplus Facilities Management (OSFM) provided the decommissioning project management. A project engineer was responsible for the work procedures, planning, cost and scheduling, and overall direction of the decommissioning work. Safety and quality assurance reviews were obtained from the UNC Environmental and Occupational Safety (E&OS) and Quality Assurance control sections.

During the decommissioning work a new management system evolved that included new decommissioning concepts, administrative controls and approvals. The Decommissioning Services Section was established under OSFM and consisted of a Decommissioning Engineering and a Decommissioning Operations group. In addition, the decommissioning project readiness review system was developed during the 115-F work. The readiness review system is described in detail in Reference 5. A decommissioning project readiness report is a central element in the review system, and is briefly described below.

3.2 DECOMMISSIONING PROJECT READINESS REPORT

The 115-F Building decommissioning project readiness report (Reference 6) is a consolidation of various decommissioning documents, each of which is directed towards a particular aspect of environmental or occupational safety, engineering considerations, or work procedures. Table 3-1 lists those documents and describes their primary functions. Completion and approval of the Project Readiness Report ensured that all aspects of the 115-F decommissioning project were understood and adequately addressed before actual decommissioning work began.

TABLE 3-1

DOCUMENTS IN THE DECOMMISSIONING PROJECT READINESS REPORT

DOCUMENT	ISSUING RESPONSIBILITY	PURPOSE
Environmental Evaluation	UNC Environmental and Occupational Safety (E&OS)	Describes environmental impact of proposed decommissioning work. Fulfills NEPA requirement.
Safety Hazard	UNC Decommissioning Engineering	Identifies radiological and industrial hazards and describes required precautions.
Decommissioning Work Procedures	UNC Decommissioning Engineering	Describes D&D step-by-step procedures and equipment required for each phase of the project work.
Radiation Work Procedures	UNC Radiation and Water Quality Control	Identifies the specific procedures required to ensure protection against unacceptable exposure to radiation.
Job Safety Analysis	UNC Decommissioning Engineering	Identifies industrial hazards and measures to eliminate or reduce them.
ARCL Calculations	UNC Decommissioning Planning	Projects post-decommissioning radiological doses based on radiological inventories and the pathway analysis method.
Summary and Detailed Check-lists	UNC Decommissioning Engineering, Operations, and E&OS.	Ensures that all cognizant departments have completed all necessary planning, approval, and procurement.

4.0 DECOMMISSIONING WORK PERFORMED

The decommissioning work included the following major tasks:

- Development of procedures
- Site preparation
- Removal of tunnel piping
- Tunnel ventilation
- Equipment waste disposal
- Contaminated waste disposal
- Demolition and site grading

4.1 DECOMMISSIONING WORK PROCEDURE

The Decommissioning Work Procedure (DWP) was prepared by Decommissioning Engineering with approvals from Environmental and Occupational Safety. The DWP included a Job Safety Analysis (reviewed and approved by the Occupational Safety group) and a Radiation Work Procedure (reviewed and approved by the Environmental Safety group). These documents are included in the decommissioning engineering data file and the 115-F Project Readiness Report.

4.2 DECOMMISSIONING OPERATIONS

4.2.1 Site Preparations

Electrical power was restored to the 115-F Building. The building substation, switch panels and wiring were all intact, but the power lines to the substation had been removed when the 105-F reactor was retired from service in 1963. The power lines were restored and the building was then relamped. A telephone was installed in the building for communication and safety reasons.

Radiation work zones were established, step-off pads were installed, and air monitoring equipment was installed in strategic locations.

The tunnel was blocked off from the 105-F building ventilation shafts at two locations with 2 x 4 stud framing covered with polyethylene sheathing.

4.2.2 Tunnel Piping Removal

Removal of the contaminated piping from the tunnel under the control room posed a problem. Other than several 3-ft (1 m) square openings sealed with heavy concrete plugs, there was no access to the tunnel within the building that would provide a way to remove piping. Outside the building, approximately mid-way between the 115-F building and the 105-F Reactor Building, there were three 3 x 10 ft (1 x 3 m) removal plugs, covered by approximately 8 ft (1.5 m) of backfill.

Three alternatives were considered for gaining working access to the tunnel:

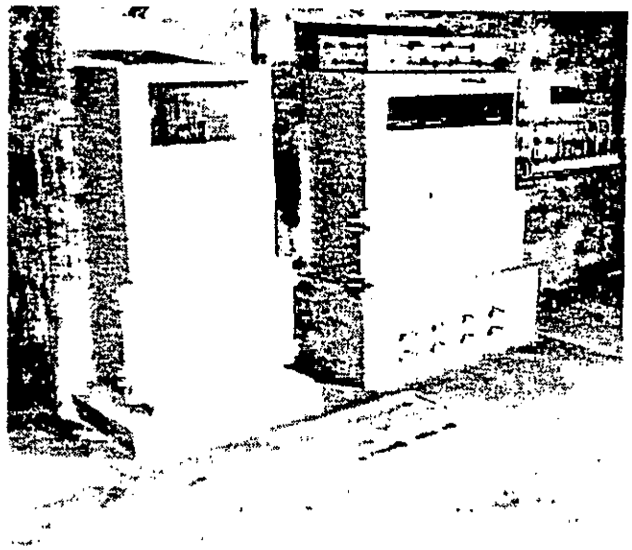
1. Excavate the west end of the building to expose the tunnel end wall, then open the end of the tunnel.

2. Excavate to expose the three exterior access plugs and remove them.

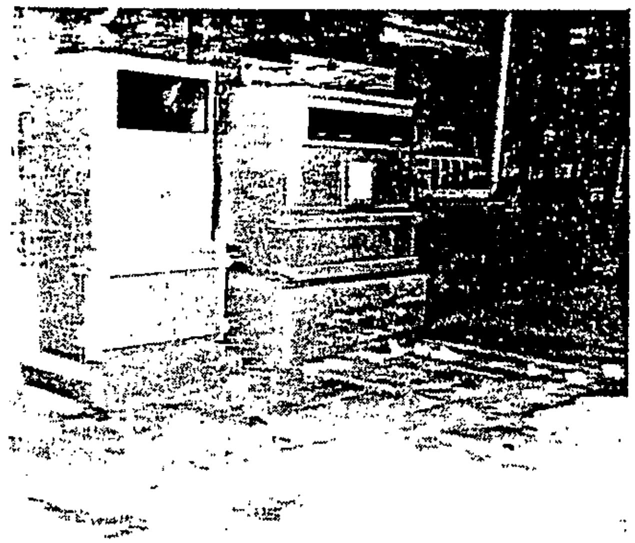
3. Make a 3 x 10 ft (1 x 3 m) opening in the control room floor.

The first two options presented confinement problems and would require the full-time use of the only available crane. The third option was selected because the confinement of the building would not be violated, and a hoist and monorail could easily be installed on the control room ceiling to remove the pipe sections.

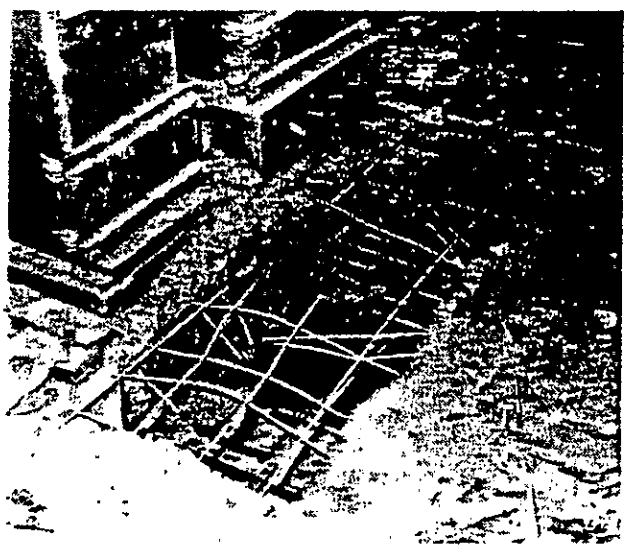
The 3-ft (1-m) thick concrete floor would have required several days of jack-hammering to make an opening. But, an explosives subcontractor who was already on site to blast down the 116-F ventilation stack agreed to blast a 3 x 10 ft (1 x 3 m) opening in the floor. With the necessary equipment and materials already on site, the work required less than two days to complete. Figure 4-1 shows the stages of this work.



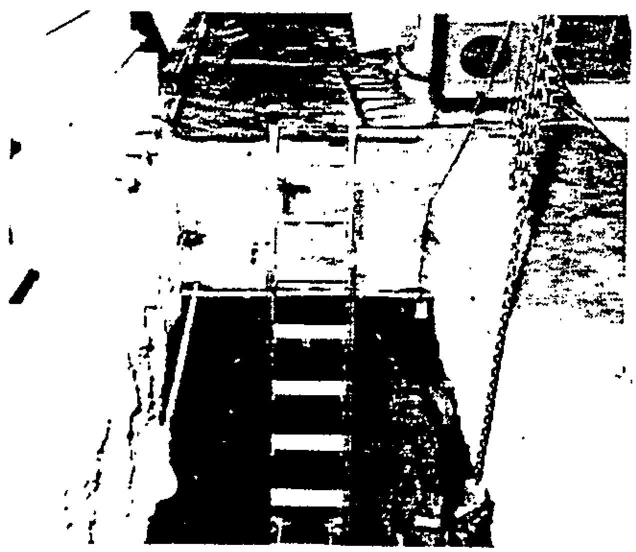
1. Control room floor.



2. Holes drilled for charges.



3. Hole after blasting.



4. Hole in use.

Figure 4-1. Tunnel Access for Pipe Removal.

The 3 ft x 10 ft opening size was determined based on removing the 16-inch schedule 80 pipe in 6-ft (2 m) lengths. The length of piping was considered for ease of handling, hoisting and transporting for burial. The original intent was to fill the pipe with shorter lengths of smaller diameter pipe. But, this approach was rejected because a 6-ft (2 m) length of 16-inch schedule 80 pipe weighs approximately 820 lb (370 kg) empty, and would weigh approximately 1,850 lb (830 kg) filled.

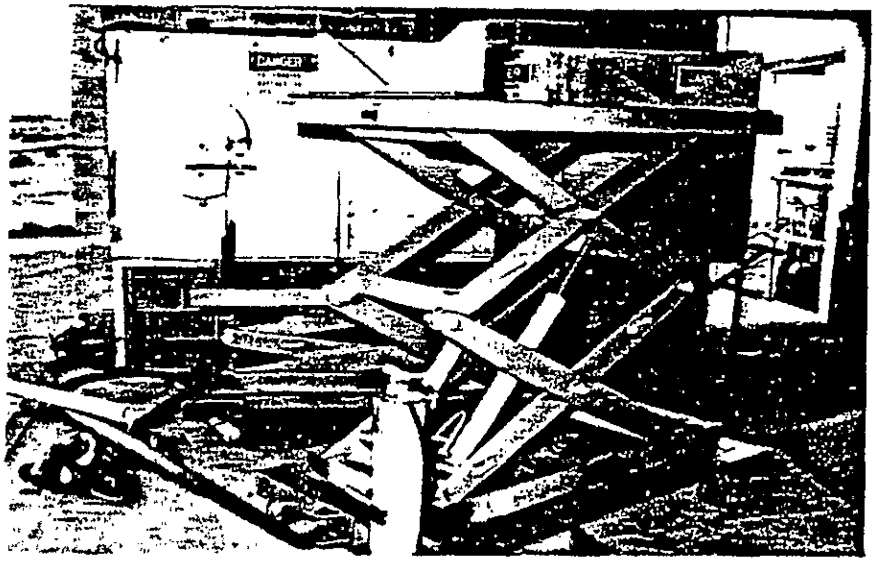
Actual work experience proved that it was more expedient to cut the small diameter piping into shorter lengths and to package them in polyethylene bags. This provided for easy handling, storing and disposal.

Two special handling dollies (Figure 4-2) were designed and fabricated to handle the pipe in the tunnel. One dolly was designed to slide under and support the 16-inch pipe (located 11 in. (28 cm) above the tunnel floor) during cutting, then roll sectioned pipe under the access opening for removal. The other dolly had a hydraulically operated scissor lift table that could be raised 41 in. (104 cm) to support the higher mounted 16-inch piping during cutting.

A mechanical cutting method was selected for cutting out the 6-ft (2 m) pipe sections (Figures 4-3 and 4-4). Oxy-acetylene cutting was ruled out due to the encumbrance of the necessary breathing air equipment in such confined quarters and the distances involved.

4.2.3 Tunnel Ventilation

A ventilating system was set up to exhaust the tunnel and to maintain a slight negative pressure. This ventilation system was assembled from noncontaminated equipment salvaged from the 105-F Reactor Building.

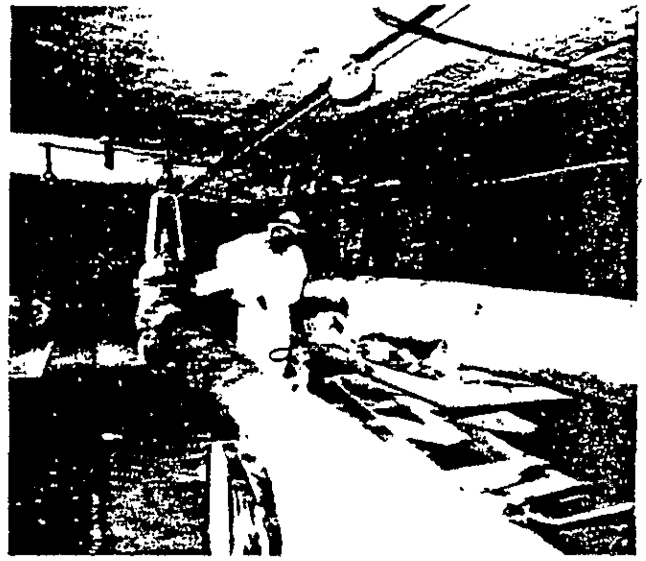


Dolly extended.

Dolly in use.

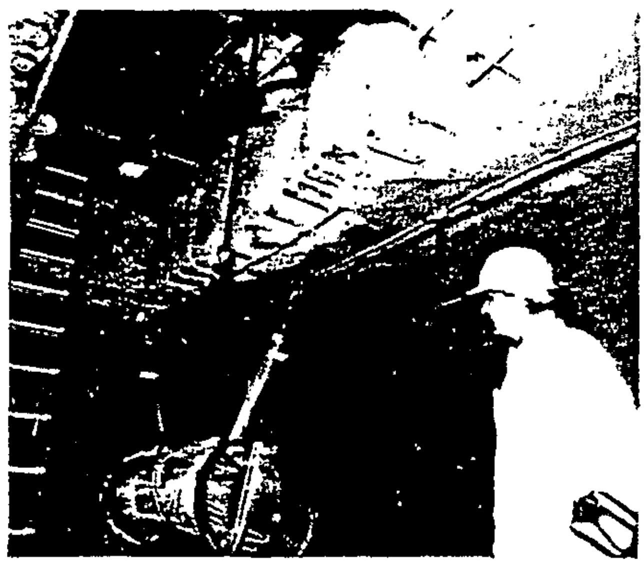
Figure 4-2. Pipe Removal Dolly.

1. Pipe being cut into 6 ft lengths.



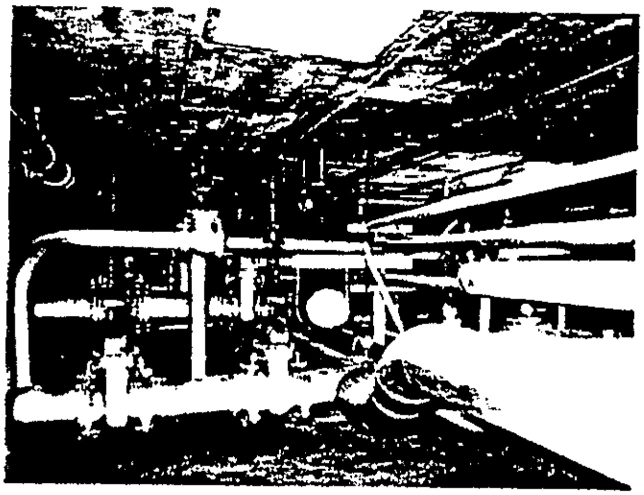
2. Supporting pipe before sectioning.

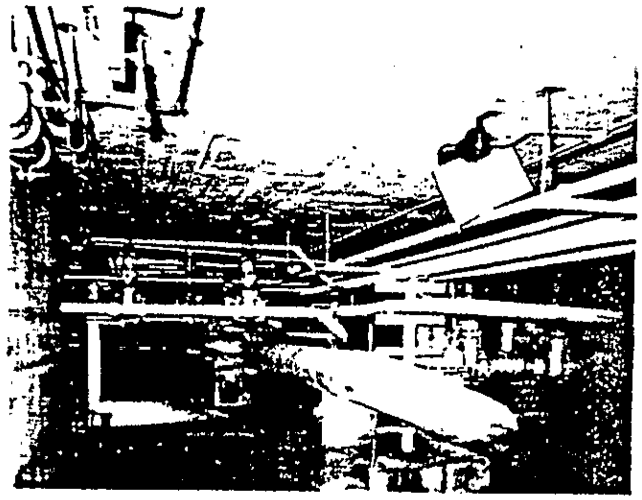
3. Valve removal using hydraulic floor crane.



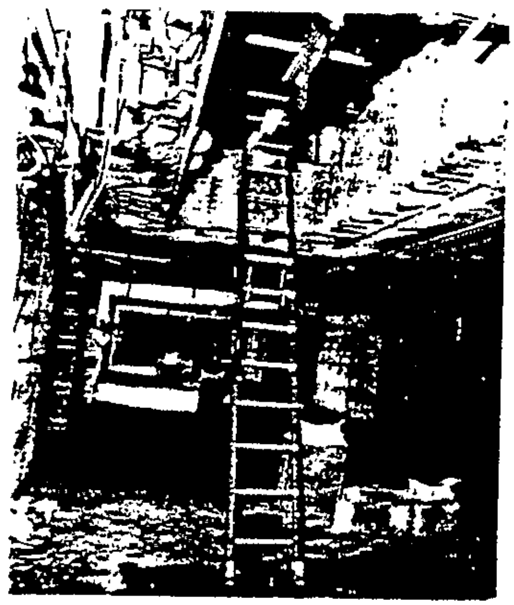
4. Pipe removal through tunnel access hole.

Figure 4-3. Pipe Removal from the 115-F Tunnel.





Tunnel before pipe removal.



Tunnel after pipe removal.

Figure 4-4. 115-F Tunnel Before and After Pipe Removal.

4.2.4 Equipment Removal

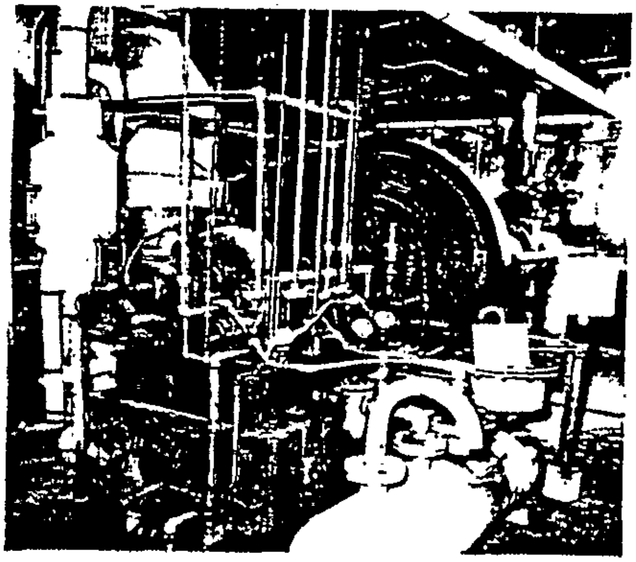
The equipment located in the dryer rooms (Figure 4-5) was disassembled or cut out in manageable sections. The condenser separator, precooler, and heater and interconnecting piping were wrapped with polyethylene sheeting prior to removal or immediately upon removal.

The silica-gel drying towers were 7-ft (2.1 m) diameter tanks each containing an average of 6.3 curies of radioactive material. The 12-inch inlet and outlet lines were disconnected. Then blank flanges were installed to contain the silica-gel. The towers were hoisted off their 4-ft (1.2-m) high concrete supports and lowered to the floor. All packaged equipment was removed from the cell by knocking out the brick-filled access in the dryer room exterior wall.

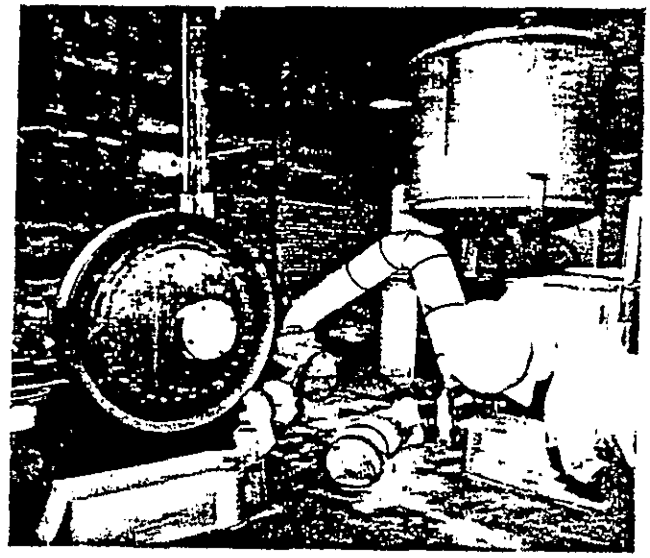
The two 6-ft x 6-ft gas filters were removed similarly to the silica-gel towers. Blank flanges were installed and the filters were removed through exterior wall openings. Noncontaminated material that was removed for accessibility along with clean building rubble, was disposed of in the 183-F clearwells. The contaminated equipment removed from the 115-F Building was shipped to the Hanford 200 West contaminated waste disposal facility.

4.2.5 Contaminated Waste Generated

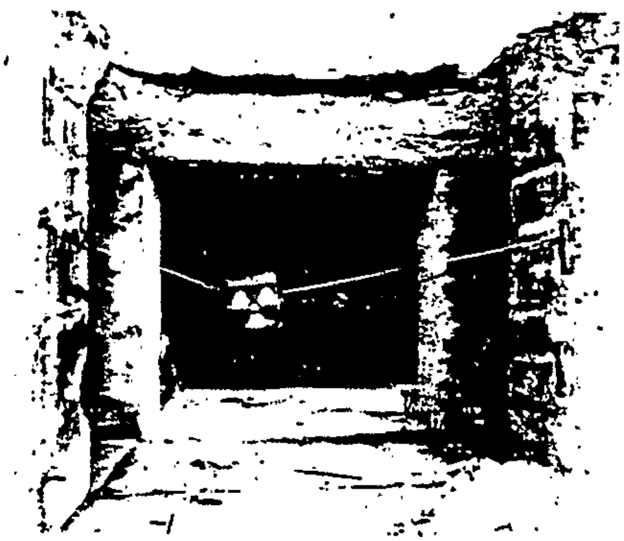
All contaminated waste (piping and equipment) was packaged and shipped in accordance with Reference 7 and disposed of in accordance with Reference 8. Table 4-1 lists the contaminated materials removed from the 115-F building prior to its demolition.



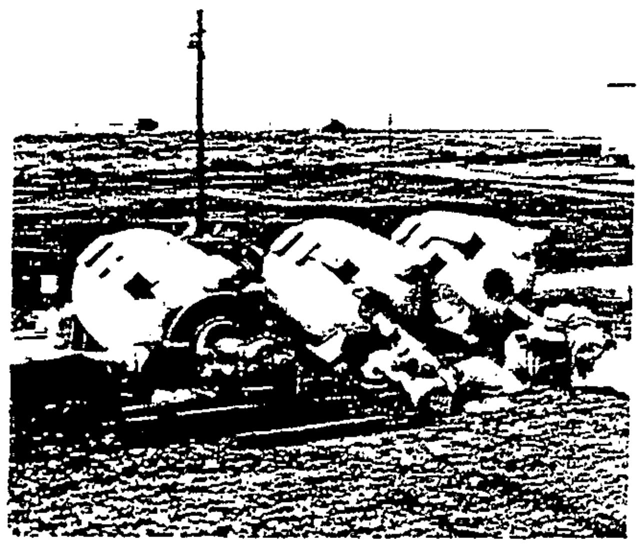
1. Dryer room before equipment removal.



2. Piping and equipment partially removed.



3. Access for silica-gel tank removal.



4. Silica-gel tanks awaiting disposal.

Figure 4-5. Equipment Removal.

TABLE 4-1

CONTAMINATED WASTE REMOVED FROM 115-F

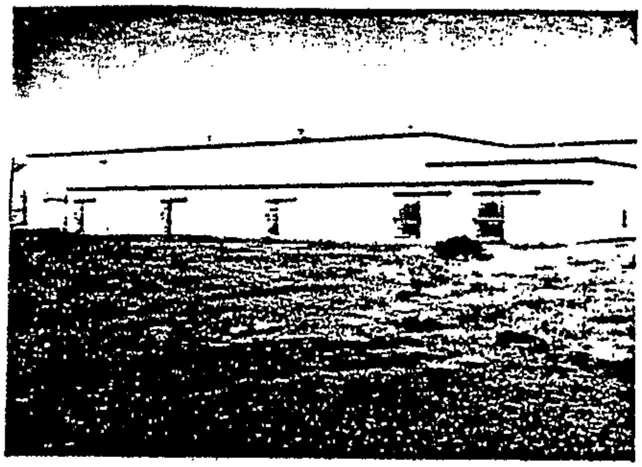
Contaminated Waste	ft^3 (m^3)	lb (kg)
Contaminated piping and valves (tunnel)	2,198 (61.5)	72,680 (32,968)
Contaminated equipment (cells)	2,419 (67.7)	55,900 (25,356)
Miscellaneous contaminated waste	375 (10.5)	2,500 (1,134)

4.2.6 Demolition

The demolition of the 115-F Gas Recirculation building was started and completed during the last quarter of FY 1984, after completing a demolition approach assessment. The demolition assessment effort began at noon January 16, 1984 using a 60-ton Linkbelt crane and a 5-ton wrecking ball on the southeast corner, which was one of the strongest sections of the building. Both the east and south walls were 3 ft (1 m) thick and heavily reinforced with 1/2-in. and 5/8-in. rebar (Figure 4-6). Several hours of beating were required to weaken this corner, but once broken, work progressed more rapidly. The rebar was cut as required to remove the rubble. Prior to demolition, the SE corner area was gridded in 100 cm^2 areas, surveyed and sampled. No contamination was found.

The concrete demolition took 4 hours to complete and the cleanup took another 4 hours. The debris and rubble were loaded into a 15-yd dump truck using a Hough front loader, and then trucked to the 100-F clearwell for disposal.

Based on the information acquired in the assessment, it was estimated that the entire 115-F Building decommissioning project would require 5 weeks for demolition plus 5 weeks for disposal of the rubble. Two weeks were added for contingency (weather, equipment servicing, etc.), making the total demolition and disposal work an estimated 12 weeks to complete. The cost was estimated to be $58,545, which included labor and equipment maintenance. An additional



1. Southeast corner before demolition.

2. Wrecking ball begins demolition.

3. Southeast corner demolished.

4. Closeup showing thickness of concrete walls.

Figure 4-6. 115-F Demolition Assessment.

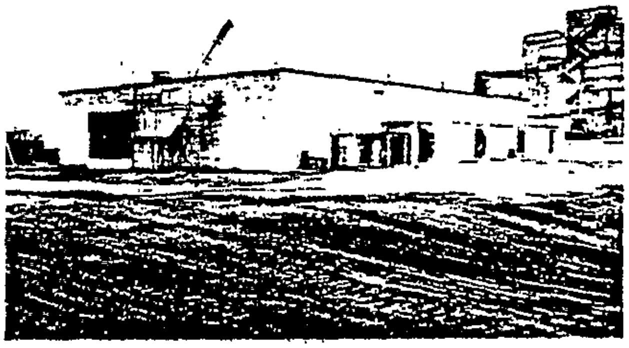
month was added to the FY 1984 schedule as a result of this decision, and the actual work was accomplished during the last quarter of FY 1984.

Subcontracting the demolition to an explosives expert would have cost approximately $94,000 ($80,000 for explosives contractor and $14,000 UNC support). The $80,000 estimate is based on past performance by an explosives demolition contractor. In addition, Decommissioning Operations personnel and equipment would have been required to support a subcontractor.

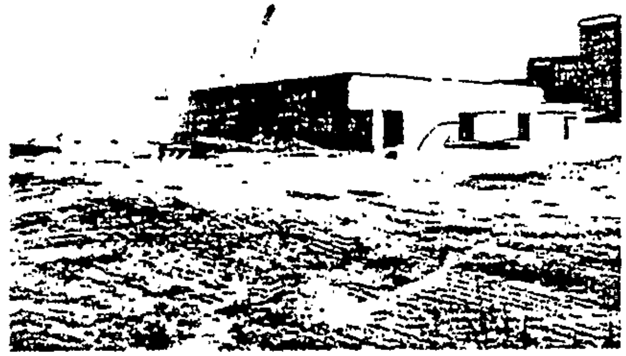
Therefore, it was deemed cost-effective to demolish the 115-F Building with Decommissioning Operations personnel and equipment. Not only would an estimated cost savings of $35,295 be realized, the work would be completed before a subcontractor could finish the project.

Demolition work started on the uncontaminated west end of the building on July 6, 1984 and completed in October 1984. Of this 12-week period, equipment downtime for maintenance and repairs accounted for 3 weeks. Figures 4-7 and 4-8 show the demolition.

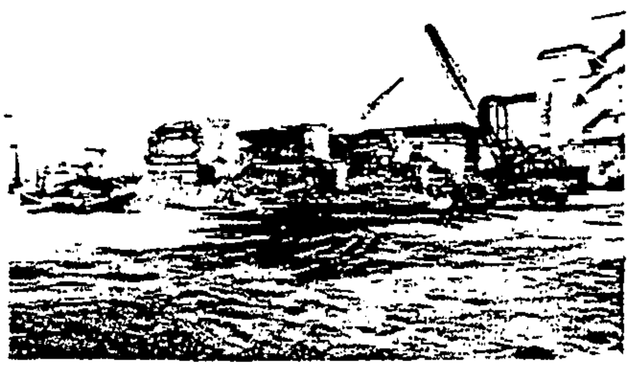
The below-grade perimeter walls, which extend down 13 ft (4 m) below grade, were demolished down to 3 to 4 ft (1 to 1.2 m) below grade. The remaining walls were left intact and serve as containment for the building rubble. The entire area was covered with clean backfill material. This overburden averages 4 to 5 ft (1.2 to 1.5 m) in depth and exceeds the ARCL requirement for 1 m of clean backfill. In addition, grading the final site to be compatible with the surrounding terrain added another 3 to 4 ft (1 to 1.2 m) of clean backfill over the site.



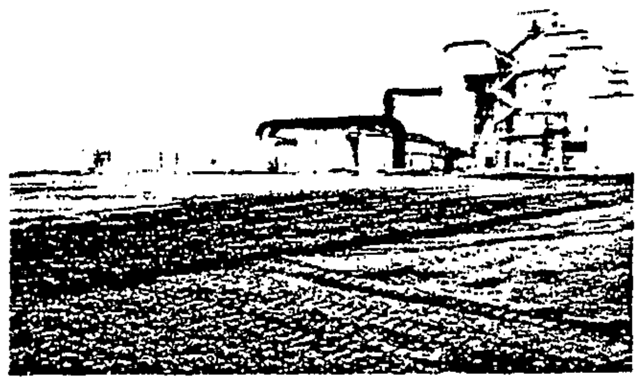
1. 115-F before demolition, showing equipment access from dryer rooms.



2. West end of building demolished.

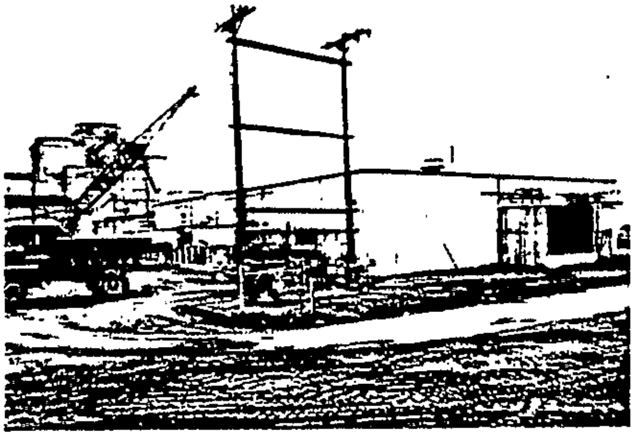


3. Demolition 70% complete.

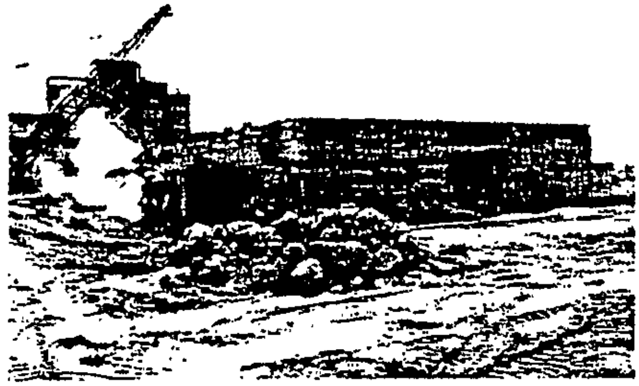


4. Final site grading completed.

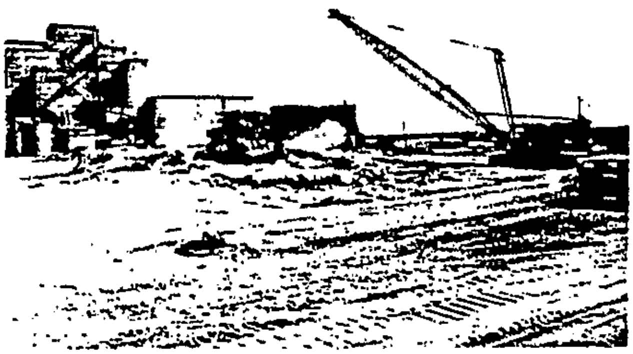
Figure 4-7. Demolition of 115-F (NE View).



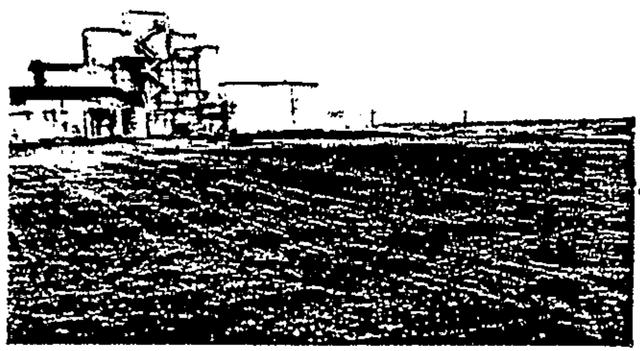
1. 115-F before demolition.



2. Demolition about 50% complete.



3. Demolition about 85% complete.



4. Final site grading completed.

Figure 4-8. Demolition of 115-F (SE View).

5.0 COST AND SCHEDULE

Demolition of the 115-F building was scheduled to start July 2 and to be completed in October 1984. Actual demolition work started on July 6 and was completed on September 28 with some cleanup, grading, and leveling of site during the first week in October. Equipment downtime for maintenance and repairs required 3 weeks and an additional week of downtime was expended awaiting Allowable Residual Contamination Levels (ARCL) approval and documentation, prior to starting the demolition of the contaminated portion of the structure. Table 5-1 shows estimated and actual costs, and Table 5-2 shows estimated and actual schedules.

TABLE 5-1

ESTIMATED AND ACTUAL COSTS*

	Estimated Cost	Actual Cost
FY 1983	$300K	235K
FY 1984	600K	613K
FY 1985	---	26K
Total	900K	874K
Difference	$ 26K	

TABLE 5-2

ESTIMATED AND ACTUAL SCHEDULES

Scheduled Work	Start	Complete
Equipment Removal (scheduled)	July 1983	July 1984
Equipment Removal (actual)	April 1983	May 1984
Building Demolition (scheduled)	July 1984	September 1984
Building Demolition (actual)	July 1984	October 1984

*Estimated and actual costs were based on the best reporting and cost control systems in place at the time of this project. More accurate and detailed systems have been developed for C/SCS implementation in FY 1986.

6.0 PERSONNEL RADIATION EXPOSURE

Decommissioning of the 115-F Building was accomplished without accumulating any radiation exposure to personnel. The radiological surveys conducted prior to start and during the decommissioning operations did not detect any discernible radiation dose rates. The radiation within the facility was confined to the interior of the piping, silica-gel drying towers, and other related equipment, and consisted primarily of the radioactive isotopes carbon-14 (C^{14}) and tritium (H^3). Decommissioning personnel wore their standard TLD badges, and no radiation exposure was recorded.

7.0 POST-DECOMMISSIONING

The site has been leveled and graded with clean backfill to blend with the surrounding terrain. This site remains within the 105-F seclusion area and within the security fenced area. Figure 7-1 shows the location of the 115-F, within established radiation zone markers.

The drawings for this facility have been voided and removed from the Hanford active files. Microfilm copies of all drawings will be maintained in the inactive Hanford files.

9 1 1 2 2 1 0 7 6 9

Figure 7-1. 115-F Building within Established Radiation Zone Markers.

8.0 LESSONS LEARNED

The following lesson was learned during the decommissioning of the 115-F Building:

Demolition of 3-ft (1-m) thick, high-density, reinforced concrete proved to be extremely hard on equipment. Maintenance requirements and equipment failures increased as the work progressed. The crane operator installed a truck tire between the wrecking ball and the crane cable. This greatly reduced shock and wear and tear on the crane.

The use of explosive demolition in conjunction with the heavy equipment would reduce this equipment wear and tear and should be evaluated for use in decommissioning similar structures.

9.0 REFERENCES

The following documents are cited in this report.

1. Radiation Control Manual, UNI-M-30 REV1, UNC Nuclear Industries, Richland, WA, March 1982.

2. Kennedy, W. D., Napier, B. A., Allowable Residual Contamination Levels for Decommissioning Facilities in the 100 Areas of the Hanford Site, PNL-4722/UNI-2522, Pacific Northwest Laboratory, Richland, WA, 1983.

3. Beckstrom, J. F., ARCL Calculation for Decommissioning the 115-F Gas Recirculation Building, UNI-2966, UNC Nuclear Industries, Richland, WA, 1984.

4. Dorian, J. J., Richards, U. R., Radiological Characterization of the Retired 100 Areas, UNI-946, UNC Nuclear Industries, Richland, WA, 1978.

5. Tyler, D. K., Decommissioning Project Readiness Review Manual, UNI-M-176, UNC Nuclear Industries, Richland, WA, 1984.

6. Project Readiness Report for Decommissioning the 115-F Gas Recirculation Building, UNC Nuclear Industries, Richland, WA, 1983.

7. Crass, L. L., Shipment of Radioactive and Other Hazardous Materials, UNI-M-29, UNC Nuclear Industries, Richland, WA, 1981.

8. Belgrair, D. P., Hanford Radioactive Solid Waste Packaging, Storage and Disposal Requirements, RHO-MA-222, REV2, Rockwell Hanford Operations, Richland, WA, 1984.

WP#1805F

THIS PAGE INTENTIONALLY
LEFT BLANK